WE CLAIM:

1. A fiber laser, comprising:

A linear section of fiber including,

A cladding formed from a phosphate glass host; and

A core formed from a similar phosphate glass host doped with 0.5-5.0 wt.% erbium ions and at least 0.5 wt. % ytterbium ions;

At least one wavelength-selective reflector having a characteristic linewidth, said reflector at least partially defining an optical resonant cavity of 5cm or less that includes the section of fiber; and

A source of pump radiation that illuminates the fiber to excite erbium and ytterbium ions and provide gain;

the length of said cavity producing a mode spacing that is comparable to the wavelength-selective reflector's linewidth so that the erbium lases at a single longitudinal mode and said fiber outputs a single-mode signal.

2. The fiber laser of claim 1, wherein the source of pump radiation comprises a single-mode laser that illuminates the fiber core, said core being doped with 0.5-15.0 wt. % ytterbium ions.

3. The fiber laser of claim 2, wherein the phosphate glass hosts include the following ingredients by weight percentages,

P_2O_5 from 30 to 80 percent,
Yb_2O_3 from 0.5 to 5 percent,
Er_2O_3 from 0.5 to 5 percent,
L_2O_3 from 5 to 30 percent,
MO from 5 to 30 percent,
wherein the sum of the weight percentages of Yb_2O_3 and Er_2O_3 is 2.5 % or greater, MO is selected from BaO, BeO, MgO, SrO, CaO, ZnO, PbO and mixtures thereof, and L_2O_3 is selected from Al_2O_3, B_2O_3, Y_2O_3, La_2O_3, and mixtures thereof.

4. The fiber laser of claim 2, wherein the single-mode pump laser is rated at less than 250mW, said fiber laser providing more than 50mW of output power in the single-mode signal.

5. The fiber laser of claim 1, wherein the source of pump radiation comprises a multi-mode laser that illuminates the fiber cladding, said core being doped with 5-30 wt % ytterbium ions.

6. The fiber laser of claim 5, wherein the phosphate glass hosts include the following ingredients by weight percentages,
P_2O_5 from 30 to 80 percent,
Yb_2O_3 from 5 to 30 percent,
Er_2O_3 from 0.5 to 5 percent,
L_2O_3 from 5 to 30 percent,
MO from 5 to 30 percent,
wherein the sum of the weight percentages of Yb_2O_3 and

Er_2O_3 is 10.0 % or greater, MO is selected from BaO, BeO, MgO, SrO, CaO, ZnO, PbO and mixtures thereof, and L_2O_3 is selected from Al_2O_3, B_2O_3, Y_2O_3, La_2O_3, and mixtures thereof.

7. The fiber laser of claim 5, wherein the multi-mode pump laser is rated at less than 1.5 W, said fiber laser providing more than 50 mW of output power in the single-mode signal.

8. The fiber laser of claim 1, wherein the erbium and ytterbium co-doped phosphate glass fiber provides a slope efficiency of at least 30 %.

9. The fiber laser of claim 1, wherein the fiber core has a rectangular cross-section, which imparts a single polarization on the single-mode signal.

10. The fiber laser of claim 1, further comprising a silica telecomm fiber, said phosphate fiber being fusion spliced to said silica telecomm fiber.

11. The fiber laser of claim 10, wherein the wavelength-selective reflector is formed on said telecomm fiber.

12. The fiber laser of claim 1, wherein the fiber exhibits a gain of greater than 1 dB over a range of wavelengths from 1530 nm to 1565 nm.

13. The fiber laser of claim 12, wherein the fiber

exhibits a peak gain of greater than 5 dB.

14. A fiber laser, comprising:

A linear section of fiber including

A cladding formed from a phosphate glass host; and

A core formed from a similar phosphate glass host doped with 0.5-5.0 wt. % erbium ions and 5-30 wt. % ytterbium ions;

At least one wavelength-selective reflector having a characteristic linewidth, said reflector at least partially defining an optical resonant cavity of 5 cm or less that includes the section of fiber; and

A multi-mode laser that illuminates the fiber cladding to stimulate erbium and ytterbium ions in the core and provide gain;

the length of said cavity producing a mode spacing that is sufficiently wide with respect to the wavelength-selective reflector's linewidth that the erbium lases at a single longitudinal mode and said fiber outputs a single-mode signal.

15. The fiber laser of claim 14, wherein the phosphate glass hosts include the following ingredients by weight percentages,

P_2O_5 from 30 to 80 percent,

Yb_2O_3 from 5 to 30 percent,

Er_2O_3 from 0.5 to 5 percent,

L_2O_3 from 5 to 30 percent,

MO from 5 to 30 percent,

wherein the sum of the weight percentages of Yb_2O_3 and Er_2O_3 is 10.0 % or greater, MO is selected from BaO, BeO, MgO, SrO, CaO, ZnO, PbO and mixtures thereof, and L_2O_3 is selected from Al_2O_3, B_2O_3, Y_2O_3, La_2O_3, and mixtures thereof.

16. The fiber laser of claim 15, wherein the multi-mode pump laser is rated at less than 1.5 W, said fiber laser providing more than 50 mW of output power in the single-mode signal.

17. A fiber laser, comprising:

A linear section of fiber including

A cladding formed from a phosphate glass host; and

A core formed from the phosphate glass host doped with 0.5 - 5.0 wt. % erbium ions and at least 0.5wt. % ytterbium ions;

A telecom fiber fusion spliced to the linear section of fiber;

At least one wavelength-selective reflector formed on said telecom fiber and having a characteristic linewidth, said reflector partially defining an optical resonant cavity of 5cm or less that includes the section of fiber; and

A source of pump radiation that illuminates the fiber to excite erbium and ytterbium ions and provide gain;

the length of said cavity producing a mode spacing that is sufficiently wide with respect to the wavelength-

selective reflector's linewidth that the erbium lases at a single longitudinal mode and said section of fiber outputs a single-mode signal into said telecom fiber.

18. The fiber laser of claim 17, wherein the source of pump radiation comprises a single-mode laser that illuminates the fiber core, said core being doped with 0.5-15.0 wt. % ytterbium ions.

19. The fiber laser of claim 18, wherein the phosphate glass hosts include the following ingredients by weight percentages,

P_2O_5 from 30 to 80 percent,

Yb_2O_3 from 0.5 to 5 percent,

Er_2O_3 from 0.5 to 5 percent,

L_2O_3 from 5 to 30 percent,

MO from 5 to 30 percent,

wherein the sum of the weight percentages of Yb_2O_3 and Er_2O_3 is 2.5 % or greater, MO is selected from BaO, BeO, MgO, SrO, CaO, ZnO, PbO and mixtures thereof, and L_2O_3 is selected from Al_2O_3, B_2O_3, Y_2O_3, La_2O_3, and mixtures thereof.

20. The fiber laser of claim 18, wherein the single-mode pump laser is rated at less than 250mW, said fiber laser providing more than 50mW of output power in the single-mode signal.

21. The fiber laser of claim 17, wherein the source of pump radiation comprises a multi-mode laser that

illuminates the fiber cladding, said core being doped with 5-30 wt % ytterbium ions.

22. The fiber laser of claim 21, wherein the phosphate glass hosts include the following ingredients by weight percentages,

P_2O_5 from 30 to 80 percent,

Yb_2O_3 from 5 to 30 percent,

Er_2O_3 from 0.5 to 5 percent,

L_2O_3 from 5 to 30 percent,

MO from 5 to 30 percent,

wherein the sum of the weight percentages of Yb_2O_3 and Er_2O_3 is 10.0 % or greater, MO is selected from BaO, BeO, MgO, SrO, CaO, ZnO, PbO and mixtures thereof, and L_2O_3 is selected from Al_2O_3, B_2O_3, Y_2O_3, La_2O_3, and mixtures thereof.

23. The fiber laser of claim 21, wherein the multi-mode pump laser is rated at less than 1.5 W, said fiber laser providing more than 50 mW of output power in the single-mode signal.